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**SPECIFICATION**

TO WHOM IT MAY CONCERN

20 Be it known that I, Laurent GAVOILLE, citizen of the  
French Republic and residing at :  
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have invented new and useful improvements in :

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**"Automatic construction of directories in network  
terminals"**

of which the following is a specification :

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## **BACKGROUND OF THE INVENTION**

### **1 - Field of the Invention**

5       The present invention relates generally to digital terminals, in particular telephone terminals, interconnected via a local area network LAN. The invention relates more particularly to the automatic construction of directories of called parties in the terminals when a new terminal is connected to the network or when one of the terminals changes its address.

### **2 - Description of the Prior Art**

15      In a local area network supporting the Transport Control Protocol/Internet Protocol TCP/IP at the level of the network and transport layers, i.e. in intranet networks, each terminal is associated with an IP address including, for example, a series of four bytes, for example 143.14.18.178, and where appropriate a network name which is not very evocative of the terminal, for example PC63B912. As terminal users are not accustomed to using designations of this kind, which are the preserve of data processing specialists, it has proved necessary 20 to construct a directory manually in each terminal to contain the usual names of the other terminals of the network so that they can be addressed easily, such usual names being printer X, station Y, fax 3, etc, for example. Thus in each terminal a translator function 25 associated with its directory maps the usual name of each terminal that can be called to the IP address or the 30

network name of the terminal.

As is well known in the art, when a given terminal  
is to be added to a local area network, it is necessary  
5 not only to write all the other terminals of the network  
into the directory of the given terminal, which is  
fastidious in itself, but also to update the directories  
of all the terminals of the network to include the given  
terminal, which is also fastidious. If the network  
10 contains several dozen or hundred terminals, loading the  
addresses and names into the terminals when a given  
terminal is installed represents several hours of work.

#### **OBJECT OF THE INVENTION**

15 The main object of this invention aims to remedy the  
drawbacks referred to above by automatically constructing  
the directory of the new terminal connected to a network  
and automatically updating the directories of the other  
20 terminals of the network, which has the advantage of  
avoiding the need to use the services of a data  
processing specialist to list a new terminal in a local  
area network.

#### **SUMMARY OF THE INVENTION**

Accordingly, a method of constructing directories in  
terminals connected by a local area network, the method  
includes the following steps:

30 - broadcasting a message from a given terminal in  
the network, the broadcast message containing at least a

name and an address of the given terminal,  
- in at least one other terminal, decoding the broadcast message, extracting from it the name and the address of the given terminal, inserting the extracted  
5 name and address in mapping relationship into a directory of the other terminal, and transmitting a response message containing the address of the given terminal as a receiver address and at least the name and the address of the other terminal extracted from the broadcast message,

10 and

- decoding the response message in the given terminal, extracting the name and the address of the other terminal from it, and inserting the extracted name and address in mapping relationship into a directory of  
15 the given terminal.

When the network comprises plural types of terminals, for example fax and computers, the given terminal and plural other terminals in the network define a group of terminals associated with an identifier. The  
20 broadcast message includes then preferably said identifier so that only said plural other terminals decode the broadcast message to extract from it the name and the address of the given terminal.

The broadcast message and the response message can  
25 each include a directory construction function field.

The address contained in the broadcast message or the response message can include a sender terminal address conforming to the internet protocol and/or an electronic mail address of the sender terminal.

30 The broadcasting step follows on automatically from the given terminal being connected to the network which

can be preceded by a first installation of the given terminal in the network or by disconnecting (powering down) the given terminal.

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#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Other features and advantages of the present invention will become more clearly apparent after reading the following description of preferred embodiments of the invention, which description is given with reference to the corresponding accompanying drawings, in which:

- FIG. 1 is a block diagram of a local area network including a few terminals ;

- FIG. 2 shows the structure of a level identification packet at the IP protocol according to the invention ; and

- FIG. 3 is an algorithm of the steps of a method of constructing directories in the terminals of the FIG. 1 local area network.

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#### **DESCRIPTION OF THE PREFERRED EMBODIMENTS**

This example refers to a CSMA/CD (Carrier Sense Multiple Access/Collision Detect) local area network whose topology is based on a bus BU. In FIG. 1, the network comprises N terminals  $T_1$  to  $T_N$  connected to the bus BU. In this kind of network a terminal can send a frame if it does not detect any frame on the bus BU. The preferred embodiment referred to hereinafter relates to an Ethernet network in which the frames encapsulate IP packets conforming to the TCP/IP protocols. FIG. 1 does

not show other machines that may be connected to the bus BU, for example a gateway between the local area network and the public switched telephone network constituting a PABX type private data processing platform.

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FIG. 2 shows the general structure of an IP packet with a standard header EN and a data field CD. The header includes the address of the sender of the packet if the packet is broadcast or that address and a receiver address and at least the address of the source port and the address of the destination port in relation with the directory application in a terminal at the TCP transport layer level.

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10         According to the invention, the data field CD includes an identification field IF, a function field FN and parameter fields PA. The identification field IF contains several characters that identify a group of terminals; for example, the group of terminals  $T_1$ ,  $T_2$  and  $T_n$ , with  $1 \leq n \leq N$ , referred to hereinafter, selected from the set of all the terminals  $T_1$  to  $T_N$  of the network, contains the same "fax" identifier so that the data field CD of a packet containing an identifier of that kind is processed only by the terminals  $T_1$ ,  $T_2$  and  $T_n$ . The function field FN containing a few bits indicates a function to be implemented in the terminal receiving the IP packet, for example a directory update function.

15         Each parameter field PA is made up of three sub-fields TY, LG and DO. The fields TY and LG respectively specify the data type and the length of the data contained in the sub-field DO. For example, three

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parameter fields PA1, PA2 and PA3 are included in the data field CD of the IP packet. The parameter in the field PA1 relates to the IP address of the terminal sending the IP packet, for example "124.1.2.3.",  
5 contained in the sub-field DO1, having a length of ten characters, as indicated in the sub-field LG1, and corresponding to the type TY1 = 1. The parameter in the field PA2 relates to the electronic mail (e-mail) address of the sending terminal contained in the sub-field DO2,  
10 for example "Toto.Sagem.com", having a length of fourteen characters, as indicated in the sub-field LG2, and corresponding to the type TY2 = 2. The parameter in the field FA3 relates to the network name, or preferably the usual name, of the sending terminal contained in the sub-field DO3, for example "Fax Toto", having a length of  
15 sixteen characters, as indicated in the sub-field LG3, and corresponding to a third type indicated in the sub-field TY3 = 3.

As explained hereinafter, this kind of a packet IP<sub>n</sub> is broadcast by the terminal T<sub>n</sub> in particular when it is installed in the network and the packets IP<sub>1</sub> and IP<sub>2</sub> of this kind are respectively transmitted in response from the terminals T<sub>1</sub> and T<sub>2</sub> to the terminal T<sub>n</sub>. The packet IP<sub>n</sub> is a broadcast packet which is addressed only to the other terminals T<sub>1</sub>, T<sub>2</sub> of the same group, which are characterized by an identifier IF common to the terminals T<sub>1</sub>, T<sub>2</sub> and T<sub>n</sub>, while the packets IP<sub>1</sub> and IP<sub>2</sub> are intended only for the terminal T<sub>n</sub> and consequently contain its address as the receiver address.  
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The construction of directories in the terminals T<sub>1</sub>,

T<sub>2</sub> and T<sub>n</sub> shown in FIG. 3 is triggered by one of two events signaled in steps E1 and E2.

In step E1, the terminal T<sub>n</sub> is inserted into the network by installing it and then connecting it to the bus BU. The content of the fields IF, FN and PA1 to PA3 relating to the terminal T<sub>n</sub>, as the sender terminal, can be determined at least in part by the terminal manufacturer and/or at least in part by the terminal user.

For step E2, it is assumed that one of the parameters PA1 to PA3 relating to the terminal T<sub>n</sub> already installed has been modified at the time of a connection to the network. For example, the network includes a server containing the DHCP (Dynamic Host Configuration Protocol) for dynamically attributing IP addresses to the terminals T<sub>1</sub> to T<sub>N</sub> of the network, or more generally for dynamically allocating at least one of the parameters PA1 to PA3 relating to the terminal T<sub>n</sub> when the latter is connected to the network for the first time, as in step E1, or more generally when it is connected to the network each time it is powered up. The server therefore configures the terminal T<sub>n</sub> automatically in step E2 by dynamically allocating it an IP address.

After step E1 or E2, the method of constructing directories includes the successive main steps E3 to E11, of which steps E3 and E8 to E11 are executed in the calling terminal T<sub>n</sub> and steps E4 to E7 and E11 are executed in each of the called terminals T<sub>1</sub> and T<sub>2</sub>.

After step E1 or E2, following connection of the terminal T<sub>n</sub> to the network bus BU, the terminal T<sub>n</sub> broadcasts on the bus BU the packet IP<sub>n</sub> containing in

particular parameters PA1, PA2 and PA3 which are specific to the step E3. In particular, the packet IP<sub>n</sub> contains the identifier IF common to all the terminals T<sub>1</sub>, T<sub>2</sub> and T<sub>n</sub> of the "fax" group in the network.

5 All the terminals in the network reject the packet IP<sub>n</sub> except for the terminals T<sub>1</sub> and T<sub>2</sub>, which recognize the identifier IF specific to their group. Each terminal T<sub>1</sub>, T<sub>2</sub> then executes steps E4 to E7.

10 In step E4 the packet IP<sub>n</sub> is decoded in the receiver of the terminal T<sub>1</sub>, T<sub>2</sub>, which recognizes the group identifier IF. At the level of the application service designated by the destination port in the field FN of the packet IP<sub>n</sub> and relating to updating of directories, in step E5 the terminal T<sub>1</sub>, T<sub>2</sub> extracts the parameter fields PA1 to PA3 from the packet IP<sub>n</sub>. The directory in the terminals T<sub>1</sub>, T<sub>2</sub> is then updated (step E6), in particular by entering as a new usual name the name of the terminal T<sub>n</sub> contained in the sub-field DO3 extracted from the packet IP<sub>n</sub> and the parameters in the other sub-fields DO1  
15 and DO2 extracted from the packet IP<sub>n</sub> enabling the terminal T<sub>n</sub> to be called from the terminal T<sub>1</sub>, T<sub>2</sub>. If, in harmony with step E2, terminal T<sub>n</sub> is already listed in the directory in the terminal T<sub>1</sub>, T<sub>2</sub>, the parameter(s) contained in the data field of the packet IP<sub>n</sub> respectively replace the parameter(s) already stored in  
20 the directory of the terminal T<sub>1</sub>, T<sub>2</sub>.

25 After this updating of the directory, the terminal T<sub>1</sub>, T<sub>2</sub> transmit a packet IP<sub>1</sub>, IP<sub>2</sub> conventionally containing their address as the sender address, the address of the terminal T<sub>n</sub> as the receiver address, by means of the address IP contained in the sub-field DO1 of  
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the packet IP<sub>n</sub> that has just been received, and parameters PA1 to PA3 enabling the terminal T<sub>n</sub> subsequently to call the terminals T<sub>1</sub>, T<sub>2</sub> (step E7).

The terminal T<sub>n</sub> executes steps E8, E9 and E10, which are respectively analogous to steps E4, E5 and E6, in response to each packet IP<sub>1</sub>, IP<sub>2</sub>. Because this packet contains the address of the terminal T<sub>n</sub>, the packet IP<sub>1</sub>, IP<sub>2</sub> is recognized only by the terminal T<sub>n</sub> and the directory updating application service is activated after the group identifier detected in the field IF and the corresponding function detected in the field FN of the packet IP<sub>1</sub>, IP<sub>2</sub>, respectively (step E8). The parameters PA1, PA2, and PA3 are extracted from the packet IP<sub>1</sub>, IP<sub>2</sub> thereby constructing the directory in the terminal T<sub>n</sub>, by mapping the name of the terminal T<sub>1</sub>, T<sub>2</sub> in the sub-field DO3 of the packet IP<sub>1</sub>, IP<sub>2</sub> to the address IP and the electronic mail address contained in the sub-fields DO1 and DO2 of the packet IP<sub>1</sub>, IP<sub>2</sub> (step E10). The directory in the terminal T<sub>n</sub> is therefore constructed automatically in response to all of the packets IP<sub>1</sub>, IP<sub>2</sub> from the terminals T<sub>1</sub>, T<sub>2</sub> in the group to which the terminal T<sub>n</sub> belongs.

After step E7 in each called terminal T<sub>1</sub>, T<sub>2</sub>, or after step E10 in the initially calling terminal T<sub>n</sub>, the method of constructing directories is iterated (step E11) if any of the terminals of the group in question, which has now become the terminal T<sub>n</sub>, is disconnected from the network, i.e. is stopped, and then restarted (step E2).

Accordingly, a user taking place in front of the terminal T<sub>n</sub> can send a message, for example a fax message, directly to one of the terminals T<sub>1</sub>, T<sub>2</sub> of the

group using the local directory in the terminal  $T_n$  that has just been constructed automatically, without any intervention on this directory by the user. Similarly, after the terminal  $T_n$  is installed or has been connected,  
5 a user taking place in front of the terminal  $T_1$ ,  $T_2$  can transmit a message, for example a fax message, directly to the terminal  $T_n$  using the local directory included in the terminal  $T_1$ ,  $T_2$  that has just been updated automatically, without any intervention on this  
10 directory.

The invention is not limited to an Ethernet local area network (LAN) as described above, and can be applied to any form of local area network, regardless of its size, and therefore to any local area network LAN that can be installed in a private home or in a company, or any metropolitan area network (MAN) installed in a building or in several buildings of a business, and can be applied to any local area network regardless of its  
15 architecture and its technology and therefore to any single-bus or double-bus, star-connected, cable, ring or optical fiber network, or wireless WLAN or high-performance radio LAN (HiperLAN).